SUMMARY OF TEMPERATURE AND PRECIPITATION BY SECTIONS, JUNE, 1904.

In the following table are given, for the various sections of the Climate and Crop Service of the Weather Bureau, the average temperature and rainfall, the stations reporting the highest and lowest temperatures with dates of occurrence, the stations reporting greatest and least monthly precipitation, and other data, as indicated by the several headings.

The mean temperatures for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperature and precipitation are based only on records from stations that have ten or more years of observation. Of course the number of such records is smaller than the total number of stations.

Section.	Temperature—in degrees Fahrenheit.								Precipitation—in inches and hundredths.					
	Section average.	Departure from the normal.	Monthly extremes.						Section average.	Departure from the normal.	Greatest monthly.		Least monthly.	
			Station.	Highest.	Date.	Station.	Lowest.	Date.			Station.	Amount.	Station.	Amount.
Alabama	77.8	− 0.5	Opelika	103	6	Ashville	47	15	2.94	−1.33	Opelika	6.46	Letohatchie	0.40
Arizona	78.0	− 1.0	Aztec	117	18	Grand Canyon	30	1	0.09	−0.16	Fort Grant	0.61	14 stations	0.00
Arkansas	75.6	− 1.3	Oregon	99	13	Dutton	50	7	7.11	−2.95	Arkadelphia	12.03	Osceola	2.42
California	71.1	+ 1.3	Indio Volcano Springs	116 116	12 11–13	Bodie	21	9	0.04	−0.27	Zenia	1.24	Many stations	0.00
Colorado	50.0	− 3.9	Lamar	99	30	Wagonwheel Gap	21	6	2.59	+1.09	Blaine	8.05	Delta	0.20
Florida	79.2	− 0.6	Lake City	102	19	Tallahassee	52	13	6.17	− 0.84	Myers	14.86	Tallahassee	1.33
Georgia	77.4	− 0.6	Hawkinsville West Point	102 102	21 17	Clayton	44	13	2.95	−1.79	Waycross	8.52	Milledgeville	0.79
Idaho	59.6	......	Garnet	102	29	Paris	15	24	1.18	......	Grangeville	3.44	Burnside	0.14
Illinois	69.6	− 2.2	Peoria	96	23	Antioch	39	17	3.02	−1.01	Mascoutah	6.90	Chicago	0.55
Indiana	69.6	− 2.1	Mount Vernon Rome	96 96	25 23	Syracuse Topeka, Winamac Northfield	43 43 43	1 15 12	3.03	−1.35	Holland	7.63	Rensselaer	0.52
Iowa	67.1	− 2.5	Clinton, Ridgeway Ruthven Larrabee	94 94 94	23 23 24	Charles City	35	2	3.45	−1.05	Humboldt	8.35	Amana	0.59
Kansas	70.4	− 3.2	Medicine Lodge	100	18	Hoxie	35	5, 6	7.04	+2.36	Fall River	16.07	Dodge	2.02
Kentucky	73.2	− 1.0	Owenton	99	26	Berea	48	10	3.14	−0.94	Leitchfield	6.03	Franklin	1.45
Louisiana	80.0	+ 0.5	Collinston Franklin, Libertyhill, Minden	99 99 99	17 18 18	Calhoun	56	14	3.89	−1.65	Grand Coteau	7.45	Port Eads	0.64
Maryland and Delaware	70.2	− 1.1	Millsboro, Del	99	26	Chewsville, Md	30	12	4.52	+0.97	Great Falls, Md	9.94	Seaford, Del	2.02
Michigan	63.6	− 0.9	Grayling	94	24	Humboldt	21	16	1.88	−1.66	Harrisville	5.68	Owosso	0.35
Minnesota	63.2	− 1.9	Hallock New London	90 90	16 18	Milaca	30	15	4.26	+0.05	Zumbrota	8.40	Faribault	2.08
Mississippi	78.5	− 0.4	Macon Shoccoe	102 102	27 18	Tupelo	50	15	4.37	−0.59	Greenville	8.82	Okolona	0.95
Missouri	70.5	− 3.3	Jackson Princeton, Protem	93 93	16 20	Maryville Seymour	45 45	27 7	6.42	+1.47	Nevada	13.79	Princeton	1.60
Montana	58.6	− 0.8	Ridgelawn	105	16	Grayling	20	11	1.44	−0.95	Springbrook	3.54	Anaconda	T.
Nebraska	66.2	− 2.8	Kennedy	97	18	Agate	31	26	4.71	−0.74	Burwell	9.79	Lodgepole	2.00
Nevada	63.6	+ 1.0	Martin's Ranch	106	28	Eureka	11	3	0.04	−0.34	Hawthorne, Wood	0.27	13 stations	0.00
New England*	63.3	− 2.1	Norwalk, Conn	98	26	Newton, N. H Jacksonville, Vt	31 31	10 19	3.06	−0.13	S. Egremont, Mass	10.17	Chelsea, Vt	0.86
New Jersey	68.1	− 1.1	Bridgeton	100	25	Charlotteburg	34	11	3.13	−0.40	Tuckerton	5.44	Bridgeton	1.91
New Mexico	69.2	− 1.3	Alamogordo	104	10	Winsor's	25	4	1.66	+0.19	Carlsbad	5.13	Los Lunas	0.00
New York	65.3	+ 0.2	Mount Hope	98	26	Paul Smith	29	12	3.38	−0.51	Gansevoort	7.27	Youngstown	0.93
North Carolina	73.4	− 0.9	Southern Pines	102	4	Linville	35	14	4.60	+0.10	Rockingham	8.77	Kinston	1.29
North Dakota	61.4	− 1.7	Minot	100	16	Minnewaukon	30	15	5.77	+1.74	Cando	9.84	Medora	2.01
Ohio	68.4	− 1.6	Bladensburg	98	23	Hillhouse	37	23	2.88	−1.06	Cadiz	5.65	Toledo No. 2	0.48
Oklahoma and Indian Territories.	75.1	− 1.2	Taloga, Okla	101	26	Beaver, Okla	41	27	8.23	+5.31	Fort Reno, Ind. T.	16.50	Kenton, Okla	1.14
Oregon	60.7	+ 0.5	Blalock	107	29	Riverside	22	22	0.80	−0.71	Bay City	2.71	Roseburg	0.03
Pennsylvania	67.9	− 0.6	Milford Selins Grove Coatesville, Philadelphia (Cent. Ave.)	96 96 96	25 25, 26 26	Smethport	32	13	4.06	+0.07	Herrs Island Dam	6.67	Confluence	1.62
Porto Rico	78.0	......	Manati	97	15	Adjuntas	55	5	3.92	......	Coloso	16.46	Ponce	T.
South Carolina	77.0	− 1.3	Blackville	102	4	Heath Springs Saluda, Santuc	48 48	14 15	4.06	−1.09	Effingham	11.17	Aiken	0.55
South Dakota	64.5	− 2.4	Ashcroft Cheyenne Agency	98 98	28 17	Highmore	32	6	4.07	+0.43	Spearfish	9.10	Redfield	1.43
Tennessee	74.0	− 0.7	Pope	98	19	Silver Lake	42	9	3.70	− 0.70	Celina	7.19	Clinton, Sewanee	1.46
Texas	79.9	− 1.2	Fort Ringgold	107	3	Haskell	47	5	4.28	+0.70	Arthur City	11.75	El Paso	0.54
Utah	63.3	− 2.9	St. George	102	13, 19	Soldier Summit	21	25	0.47	+0.06	Coyoto	2.30	4 stations	T.
Virginia	71.4	− 1.0	Buckingham	98	26	McDowell	35	14	5.20	+1.24	Lincoln	11.40	Columbia	2.79
Washington	60.0	− 0.4	Kennewick	107	29	Republic	27	23	1.42	− 0.25	Clearwater	4.14	Trinidad	0.00
West Virginia	69.5	− 1.1	Ryan	97	3	Bayard	36	13	4.20	−0.63	Moorefield	8.29	Bancroft	2.05
Wisconsin	63.9	− 2.4	Beloit	93	24	Prentice	30	8	3.60	−0.70	Barron	8.45	Brodhead	0.85
Wyoming	56.6	− 2.6	Basin Hyattsville	98 98	19 18	Norris Geyser Basin, Y. N. Park	13	3	1.62	+1.09	Lusk	5.83	Thermopolis	0.34

* Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut.

Wisconsin.—The temperature conditions were fairly equable, except for the first decade, when decidedly cool weather prevailed. Frost occurred in exposed localities in the northern counties, but caused no material damage. The rainfall was unevenly distributed, being excessive in portions of the northern section and deficient in many localities elsewhere. Crops made fairly good progress, except corn, which was generally small and backward.—*W. M. Wilson.*

Wyoming.—The month was unusually cool, and killing frosts with freezing temperatures prevailed over much of the State on the 25th, damaging potatoes and gardens, and in some sections grain and alfalfa. The rains were excessive in some sections, and ranges kept in excellent condition. Meadows made good growth, and a good first crop of alfalfa was secured. Streams were high, and water plentiful; very little irrigation was necessary.—*W. S. Palmer.*

SPECIAL ARTICLES.

FREDERIC HENRY CLARKE.

Frederic Henry Clarke, Local Forecaster, United States Weather Bureau, died on the 8th day of June, 1904, at Scranton, Pa. He was born in Fairfax County, Va., on the 26th day of February, 1857, educated in the public schools of Washington, D. C., and on the 3d day of March, 1879, entered the meteorological service of the Signal Corps, United States Army, as second-class private. He rose to a sergeancy, August 17, 1885, and, on the transfer of the meteorological service to the Department of Agriculture, became an observer in the Weather Bureau, and finally attained the responsible position he held at the time of his decease.

In his twenty-five years of service he had been on duty on nearly twenty different stations, scattered from coast to coast and from arctic seas to the Gulf of Mexico. His labors from 1883 to 1886 at St. Micheals, Alaska, the farthest north of the weather stations, were particularly appreciated and valued.

He was a polished gentleman, genial, cheerful, and generous, and easily won his way in the esteem of the communities to which the service called him. He was industrious and efficient, and was frequently commended for the accuracy of his meteorological work.

EARTHQUAKES OF JUNE 25 AND 26, 1904.

By Prof. C. F. MARVIN.

The seismograph at the Weather Bureau recorded an earthquake on June 25, beginning at 4 hours, 12 minutes, 31 seconds, p. m., and another on June 26, beginning at 7 hours, 21 minutes, 3 seconds, p. m. The record in both cases indicated a very slight displacement of the earth at Washington, but the character of the records is such that we believe the origins were at very great distances and seemingly nearly the same for both earthquakes. The disturbances of themselves were probably of considerable violence.

In the record of the first earthquake, especially, the amplitude of the movement at Washington was very small, and exact measurements of the record can not be made The different phases ordinarily characteristic of earthquake records from instruments of this class are more clearly defined in the second than in the first earthquake.

The Omori seismograph, by which these records were made, was fully described and illustrated in the MONTHLY WEATHER REVIEW for June, 1903, page 271.

The following table gives the times of the principal features of both records. The north and south component of horizontal motion only is recorded.

Earthquakes of June 25 and 26, 1904, p. m., seventy-fifth meridian time.

	June 25.			June 26.		
	h.	*m.*	*s.*	*h.*	*m.*	*s.*
First preliminary tremors	4	12	31 p. m.	7	21	03 p. m.
Second preliminary tremors	—	—	— p. m.	7	46	56 p. m.
Principal portion began	4	44	59 p. m.	7	55	26 p. m.
Principal portion ended	4	55	46 p. m.	7	57	01 p. m.
Maximum waves at	4 4	50 53	36 p. m. 24 p. m.	7	55	56 p. m.
End of earthquake	5	29	04 p. m.	8	25	09 p. m.
Duration of first preliminary tremor		32	28		34	23
Average period of complete waves in principal portion			20			20
Period of pendulum			26			26
Maximum double amplitude of actual displacement of earth at seismograph				0.26 mm.		
Magnification of record				10		

STUDIES ON THE CIRCULATION OF THE ATMOSPHERES OF THE SUN AND OF THE EARTH.

VII.—THE AVERAGE MONTHLY VECTORS OF THE GENERAL CIRCULATION IN THE UNITED STATES.

By Prof. FRANK H. BIGELOW.

In Table 9, page 144, Annual Report of the Chief of the Weather Bureau, 1898–1899, may be found the data resulting from the nephoscope observations taken in the international cloud year, 1896–1897, which were made to determine the general motions of the atmosphere over the United States. In Table 33, page 409, of the same volume, is given a summary of the resulting general velocities as annual normals. It remains to compute the mean monthly normal vectors of the circulation, and it has been done by the methods used in computing similar vectors for the West Indies, so that but few preliminary remarks are needed in this connection. The method now in use in the Weather Bureau of determining the monthly direction of the wind at a station is really inadequate to the requirements of modern science, which demands an accurate knowledge of the azimuth direction and velocity of the wind. The method referred to consists in counting the number of times the wind was reported on each of the eight cardinal points, N., NE., E., etc., and assigning as the monthly direction that which has the plurality of numbers. This gives no true resultant direction and takes no account of the velocity of the wind prevailing at each observation. A second method of reducing wind observations, which is somewhat more accurate than the former, consists in assuming an equal velocity for each wind and combining the frequency numbers by using Lambert's formula or its equivalent. This system gives a true resultant direction for winds of uniform velocity, but where the winds are variable in force, as well as in direction, this is also insufficient. Many examples of inaccurate resultants can be given when the individual velocities are not constantly the same.

The vectors of Table 16, and figs. 77 to 88, Charts XI, XII, and XIII, "Average monthly vectors of the general circulation," have been computed accurately by resolving each vector V_1 φ, as observed, into its north to south and west to east components, taking the algebraic sum of each, and thence computing the mean component for the series, in this case for each month of the year. Then the resultant vectors in velocity and azimuth were constructed, and appear in Table 16 under the columns V, φ. Since the resultant vectors in the lower cloud level and at the surface are very small, I have also computed the mean motion of the wind for each month without regard to the azimuth direction, and this is given under V_1. In the middle and the upper cloud strata the azimuth directions are not so variable as nearer the surface, and hence, there is less difference between the values of V_1 and V. The resultant vectors V, φ have been plotted in two arrangements, the first giving the vectors of the month for each cloud system terminating on the same vertical lines, which permits a ready inspection of the relative motion in the different levels for each month of the year. The second arrangement gives the vectors for June ending on one vertical line, while those for the other months follow in a broken line, which shows at a glance the trend of the circulation throughout the year in the several cloud groups. It has been convenient to divide the clouds into three groups, (1) the lower clouds (stratus, cumulus, stratocumulus), (2) the middle clouds (alto-stratus, alto-cumulus), and (3) the upper clouds (cirro-cumulus, cirro-stratus, cirrus), which do not differ greatly among themselves in velocity. The average height of group (1), lower clouds, is 2000 meters; of group (2), middle clouds, 5000 meters, and of group (3), upper clouds, 9000 meters, as determined by the theodolite observations at Washington, in 1896–1897.

We make the following remarks on the vectors of Charts XI to XIII. The northern group of stations, St. Paul, Detroit, Cleveland, Buffalo, Louisville, Blue Hill, Washington, Waynesville, and Ocean City, all lie in the strong eastward drift to the north of the high pressure belt of the general circulation; Kansas City, Abilene, and Vicksburg, lie in the midst of this belt, while Key West is on the southern border of it and has some of the characteristics of the West Indian group of stations. The northern stations in the upper levels have strong eastward components, and in the lower levels a turbulent circulation with small resultant vectors. Louisville seems to have something like a personal equation, which has magnified the vectors a little above the apparent average that the entire set would suggest, while Cleveland, on the other hand, seems to have a diminished set of vectors. It is not possible to show from the observations what change, if any, ought to be introduced by means of a modifying factor. Besides the relative lengths of the vectors in the different levels it is interesting to note the north and south components at the several stations. Thus, at St. Paul and also at Kansas City, there is a northward component in the cirrus levels; this component prevails at all levels at Abilene. At Vicksburg the vectors are generally small, and they are westward during certain months